



(19)

Generated Document.

(11) Publication number: 01268064 A

## PATENT ABSTRACTS OF JAPAN

(21) Application number: 63095564

(22) Application date: 20.04.88

(51) Intl. Cl.: H01L 29/78 H01L 21/205 H01L 27/10

(30) Priority:

(43) Date of application 25.10.89  
publication:

(84) Designated contracting states:

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(54) FORMATION OF  
POLYCRYSTALLINE  
SILICON THIN FILM

(57) Abstract:

PURPOSE: To make it possible to manufacture a polycrystalline Si MOS type field-effect transistor characterized by a small OFF current, a small absolute value of threshold voltage and a large operating current, by using disilane or trisilane as a reacting gas, performing deposition in an amorphous state at a specified temperature, performing a heat

treatment and polycrystallization.

CONSTITUTION: Decomposition is performed at a temperature of 550°C or less by using disilane or trisilane as a reacting gas, and deposition is performed under an amorphous state. Heat treatment is performed at a temperature higher than the deposition temperature, and a polycrystalline state is obtained. For example, an amorphous Si film 13 is deposited on an SiO<sub>2</sub> film 12 on a P-type Si substrate 11 by an LPCVD method by using Si<sub>2</sub>H<sub>6</sub> gas as a reacting gas at a temperature of 520°C. The film is patterned in an island shape. Thereafter, an SiO<sub>2</sub> film 14 is deposited. Heat treatment is performed at 900°C, and a gate oxide film is obtained. Then, P ions are implanted in the polycrystalline Si 13. A polycrystalline Si film is deposited by using SiH<sub>4</sub> as a reacting gas, and a gate electrode 15 is formed. Then, an SiO<sub>2</sub> film is formed by heat treatment. BF<sub>2</sub> ions are implanted, and P-type high concentration impurity regions for a source, a drain and a gate are formed.

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